

Lucent Technologies
Bell Labs Innovations



DSLPipe DSU (SDSL)

User's Guide

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- Fax—(510) 814-2312
- Customer Support BBS (by modem)—(510) 814-2302

Write to Lucent at the following address:

Attn: Customer Service
Lucent Technologies
1701 Harbor Bay Parkway
Alameda, CA 94502-3002

Important safety instructions

A. GENERAL

- 1 Read and follow all warning notices and instructions marked on the product or included in the manual.
- 2 There are no operator serviceable parts within the unit. Refer all servicing to trained service personnel.
- 3 Product installation should be performed by trained service personnel only.
- 4 Install only in restricted-access areas in accordance with UL1950, C22.2 No. 950, and IEC60950
- 5 The maximum recommended operating ambient is 104° F (40° C). Allow sufficient air circulation or space between units when installed in a closed or multiple-rack assembly.
- 6 Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these slots and openings must not be blocked or covered. Installation without sufficient airflow can be unsafe.
- 7 Equipment mounted in a rack should be distributed to prevent a possible hazardous condition due to uneven loading. The rack should safely support the combined weight of all equipment. This product weighs XX lb. (XX kg).

- 8** The power source has to be adequately rated to assure safe operation of the equipment. The building installation and/or power source must provide overload protection.
- 9** Protective earth (PE) connection is essential to ensure safe operation before connecting to the power supply and telecommunication network. Do not defeat the purpose of the grounding-type plug by modifying the plug or using an adapter. Use an outlet tester or a voltmeter to check the ac receptacle for the presence of earth ground. If the receptacle is not properly grounded, the installation must not proceed until a qualified electrician has corrected the problem.

If the power supply is fed from a power source with no protective-earthing path (such as in certain Nordic countries), connect an earth-grounded copper wire to the dedicated wiring terminal marked with \oplus (PE symbol) on the chassis. The minimum size of the wire for a DSLPipe V.35 unit with rated input current not exceeding 6A is AWG 18 and cross-sectional area 0.75 mm².

Models with ac power inputs are intended for use with a single-phase three-wire power cord (which includes earthing conductor).

For models with dc power inputs, the protective earth connection must be established by using the dedicated earthing terminal marked with the PE symbol or, if provided, the earthing pin of the input terminal block.

- 10** Models with dc power inputs must be connected to a -48V dc supply source that is electrically isolated from the ac source in accordance with UL1950, C22.2 No. 950, and IEC60950.
- 11** For products installed in Nordic countries (except Central Office equipment), a type B plug or permanent connection must be used for connections to the main power supply.
- 12** Before installing wires to the dc power terminal block, verify that these wires are not connected to any power source. Installing live wires (that is, wires connected to a power source) is hazardous.
- 13** Do not allow anything to rest on the power cord, and do not locate the product where people will walk on the power cord.
- 14** Do not attempt to service this product yourself. Opening or removing covers can expose you to dangerous high voltage points or other risks. Refer all servicing to qualified service personnel.
- 15** General purpose cables are provided with this product. Special cables, which might be required by the regulatory inspection authority for the installation site, are the responsibility of the customer.

- 16** When installed in the final configuration, the product must comply with the applicable safety standards and regulatory requirements of the country in which it is installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.
- 17** A rare phenomenon can create a voltage potential between the earth grounds of two or more buildings. If products installed in separate buildings are interconnected, the voltage potential might cause a hazardous condition. Consult a qualified electrical consultant to determine whether or not this phenomenon exists.

In addition, if the equipment is to be used with telecommunications circuits, take the following precautions:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using equipment connected to telephone lines (other than a cordless telephone) during an electrical storm. There is a remote risk of electric shock from lightning.
- Do not use a telephone or other equipment connected to telephone lines to report a gas leak in the vicinity of the leak.



Warning: To reduce the risk of fire, communication cable conductors must be 26 AWG (0.13 mm²) or larger.



Avertissement: Afin de réduire les risques d'incendie, les fils conducteurs du câble de communication doivent être d'un calibre minimum de 26 AWG (American Wire Gauge), c'est-à-dire d'un minimum de 0,13 mm².



Warnung: Um Feuer-Risiko zu reduzieren, müssen die Querschnitte der Kommunikationskabel-Leiter 0,13 mm² oder größer sein.

B. SPECIAL REQUIREMENTS

- 18** Lithium batteries:



Warning: The battery can explode if incorrectly replaced. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.



Avertissement: Il y a danger d'explosion si la batterie n'est pas remplacée correctement. Remplacer uniquement avec une batterie du même type ou d'un type recommandé par le fabricant. Mettre au rebut les batteries usagées conformément aux instructions du fabricant.



Warnung: Die Batterie kann eventuell explodieren, wenn sie nicht ordnungsgemäß ausgetauscht wird. Ersetzen Sie die Batterie nur mit einer Batterie des gleichen oder eines ähnlichen vom Hersteller empfohlenen Typs. Entsorgen Sie gebrauchte Batterien gemäß den Anweisungen des Herstellers.

19 Mains Disconnect (no power switch):



Caution: The power supply cord is used as the main disconnect device. Make sure that the outlet socket is located/installed near the equipment and is easily accessible.



Attention: Le cordon d'alimentation est utilisé comme interrupteur général. La prise de courant doit être située ou installée à proximité du matériel et être facile d'accès.



Vorsicht: Zur sicheren Trennung des Gerätes vom Netz muß der Netzstecker gezogen werden. Stellen Sie sicher, daß sich die Steckdose in der Nähe des Gerätes befindet und leicht zugänglich ist.

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Introduction

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The DSLPipe DSU (SDSL) is a modem that allows you to send data across two dissimilar devices. The unit converts data to an SDSL format and sends it to the destination device. You can use the unit for high-speed symmetrical data transmission (from 144 Kbps to 2320 Kbps) on a single copper twisted-pair wire.

Note: You cannot use a DSLPipe DSU for channelized services such as voice transmission.

The DSLPipe DSU uses 2B1Q line encoding with echo cancellation to transfer at a high data rate. It also provides high immunity to background noise. The size of the wire, in part, determines the maximum transmission rate and distance, as shown in Table 1-1.

Table 1-1. DSLPipe DSU transmission rate

Wire gauge	Data Transmission Rate (in Kbps)	Distance (in feet)
24	2320	12,100
24	768	17,700
26	2320	9,300
26	768	13,700

DSLPipe DSU features

The DSLPipe DSU includes the following features:

- High-speed SDSL transport over a single copper twisted-pair telephone line
- Symmetrical multirate data transmission from 144 Kbps to 2320 Kbps
- Compatible and interoperable with major COE routers
- Easy-to use
- Low power consumption
- Easy configuration
- COE or CPE configuration
- Transmission distance of almost 18,000 feet at 786 Kbps (with a 24 gauge wire)

DSLPipe DSU configuration

You can use a DSLPipe DSU as either a Customer Premises Equipment (CPE) or Central Office Equipment (COE). Figure 1-1 illustrates how you can use the unit as a CPE.

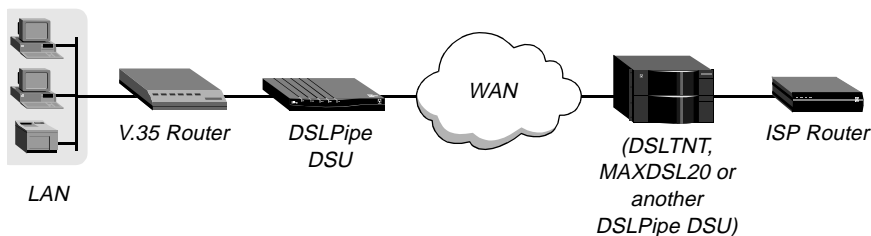


Figure 1-1. Example: Using a DSLPipe DSU as CPE

A DSLPipe DSU accepts HDLC data from a V.35 router. It converts the data into SDSL format and sends it, via a WAN link, to a DSLTNT, a MAXDSL20 or another DSLPipe DSU (configured as COE). The DSLTNT, MAXDSL20, or DSLPipe DSU then sends the data to the appropriate ISP router.

Figure 1-2 illustrates how you can use a DSLPipe DSU as COE.



Figure 1-2. Example: Using a DSLPipe DSU as COE

The DSLPipe DSU in Figure 1-2 accepts HDLC data from V.35 Router A. The unit converts the data into SDSL format and sends it, via a WAN link, to another DSLPipe DSU that is configured as CPE. That unit then sends the data to V.35 Router B.

DSLPipe DSU architecture

Figure 1-3 illustrates the DSLPipe architecture.

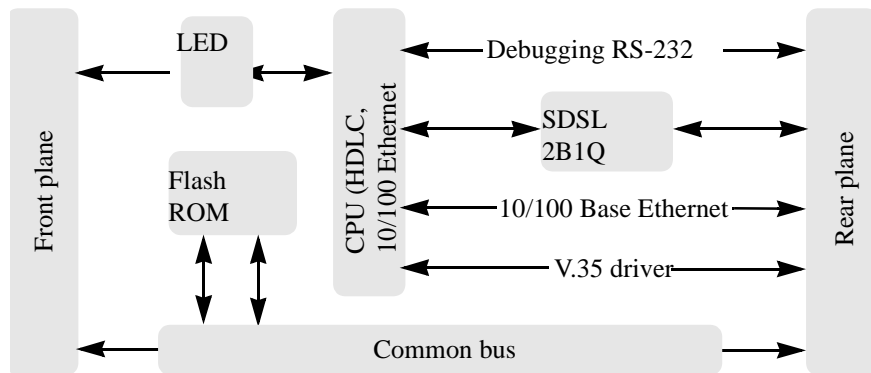


Figure 1-3. DSLPipe DSU architecture

The DSLPipe DSU driver picks up the HDLC data and sends it to the Ethernet controller for processing. The data is sent via the bus to the SDSL chip. The chip converts the data to RFC 1490 packets and sends it across a WAN link to another device.

Installation

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The DSLPipe DSU (SDSL) modem is easy to install. Open the package and identify the two cables, then set up the unit, and check the activity of the LED status lights.

Checking package contents

The package in which you received your DSLPipe DSU should contain the following items. See Figure 2-1.

- 1** DSLPipe DSU. The model name, DSL-HST-DSU, is printed on the bottom of the unit.
- 2** V.35 to DB-25 connector
- 3** WAN cable with RJ-11 modular plug connectors
- 4** *DSLPipe DSU (SDSL) User's Guide*
- 5** Power supply

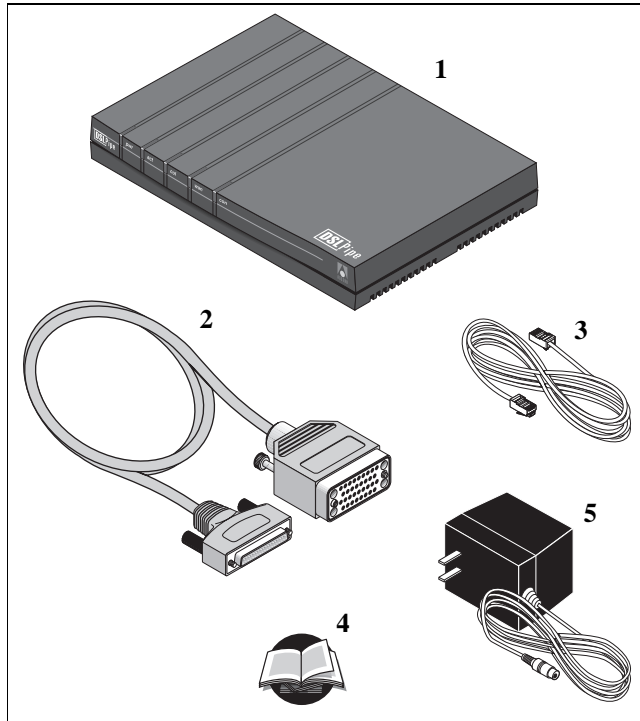
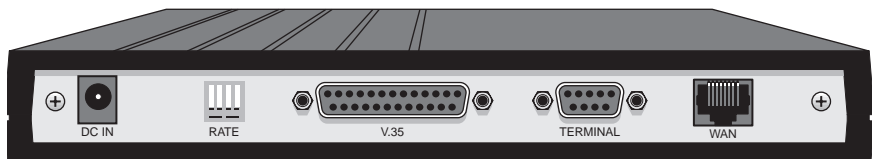


Figure 2-1. Package contents

Setting up the DSLPipe DSU

Figure 2-2 shows the DSLPipe DSU's rear panel. To set up your DSLPipe DSU, you use components located on the rear panel to set the data transmission rate, configure the unit as either CPE or COE, and connect the necessary cables

Figure 2-2. DSLPipe DSU Rear Panel



Setting the data transmission rate

To set the DSLPipe DSU data transmission rate, use a pen to move the DIP switches. Table 2-1 shows the DIP switch settings for each rate. Move the DIP switch down to turn the switch on. Move a switch up to turn it off.

Table 2-1. Data transmission settings

Rate	DIP Switch 1	DIP Switch 2	DIP Switch 3
144 Kbps	ON	ON	ON
272 Kbps	ON	ON	OFF
400 Kbps	ON	OFF	ON
528 Kbps	ON	OFF	OFF
784 Kbps	OFF	ON	ON
1168 Kbps	OFF	ON	OFF
1552 Kbps	OFF	OFF	ON
2320 Kbps	OFF	OFF	OFF

Configuring the unit as either CPE or COE

If you want the DSLPipe DSU to function as a CPE, leave the fourth DIP switch in the up (off) position. If you want the unit to function as a COE, move the fourth DIP switch down.

Note: JP3 and JP4 must be installed for Dip Switch 4 to be functional.

Table 2-2 shows the proper setting for each configuration.

Table 2-2. CPE vs. COE configuration

Configuration	DIP Switch 4
CPE	OFF
COE	ON

Connecting the cables

To connect your DSLPipe DSU:

- 1 Use the V.35 to DB-25 cable to connect the V.35 device to the DSLPipe DSU.
- 2 Use the WAN cable to connect the DSLPipe DSU to the SDSL line.
- 3 Use the power supply cable to connect the DSLPipe DSU to a power source. Plugging the power supply automatically turns on the DSLPipe DSU.

Checking the activity of the LED lights

To verify that your DSLPipe DSU is connected properly, observe the activity pattern of the lights at the front of the unit (see Figure). When all the cables are connected, verify that:

- The `con` light is on initially and then turns off. It blinks if there are any SDSL errors.
- The `wan` light turns on after the `con` light turns off. It blinks until a connection is established, and then remains on.
- The `lnk` light is on if the DSR (Data Set Ready) or the RTS (Request To Send) control on the V.35 port is active.
- The `act` light blinks when there is any DSL activity, but it remains off otherwise.
- The `pwr` light comes on and remains on.

Figure 2-3 shows the location of the status lights on the DSLPipe DSU front panel.

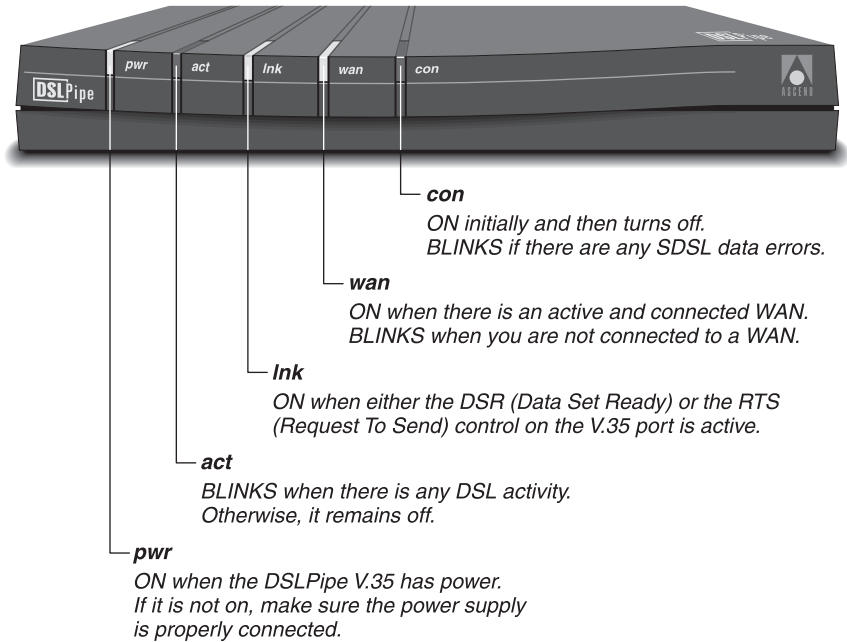


Figure 2-3. Location of the LED lights in the DSLPipe DSU front panel

Viewing configuration information

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Before you can view the configuration information for the DSLPipe unit, you must set up VT100 emulation to view the on-board software.

Items you need

- You need a serial cable that can plug into an available, enabled serial port on your computer. The other end of the cable must have a male DB-9 connector to fit the serial port connector on the back of the DSLPipe unit. If your computer is a Macintosh, the cable must fit the modem port's nine-pin mini DIN connector.
- You also need communications software that supports VT100 emulation.

Connecting serial cable and setting up communications software

To establish a serial connection, proceed as follows:

- 1 Use a serial cable to connect your computer's serial (or modem) port to the terminal port on the back of the DSLPipe unit.

- 2 Use a communications program (such as HyperTerm, PROCOMM PLUS, Zterm, or any other program that supports VT100 terminal emulation) to open a session directly with the port to which the DSLPipe unit is connected.
- 3 Set your communications software to connect with the following settings:

Note: If you are not already familiar with the settings listed, see the documentation for your communications software. If you're using the software for the first time, going through an online or printed tutorial (if the software includes one) is a good way to get started.

- **Direct connection:** Tell the software that there is a serial cable connecting the DSLPipe directly to the computer.
 - **Serial port:** Specify which of the computer's serial ports the software uses. If the only serial port available is currently used by an internal modem, you may need to use your computer's setup software to specify an external connector for the port that will be used in place of the internal modem. In some cases, you also may need to remove the modem. See the manual for the modem and your computer's user manual for details.
 - **Terminal type:** Specify VT100.
 - **Duplex:** If the software lets you choose, specify Full. Because this is by far the most common choice, most communications software sets this by default.
 - **Bits per second:** Specify 57600.
 - **Data bits:** Specify 8.
 - **Parity:** Specify None.
 - **Stop bits:** Specify 1.
 - **Flow control:** Turn *off* software flow control (XON/XOFF) and, if possible, hardware flow control (RTS/CTS). Specify None.
- 4 Your communications program should now display the DSLPipe main window. If it does not, press the Enter key.
The following message appears on the screen:
Select Function Items?
Press Ctrl-L and the following message appears:
Press any key to continue...

Press any key on the keyboard and the DSLPipe unit's configuration menu appears:

SDSL V.35 DSU	Software Version 3.31
0. Show DSL Status	
1. Change Configuration	
2. Upgrade Operation Software	
3. Upgrade SDSL Firmware	
4. Debug Mode	

Figure 3-1. DSLPipe configuration window

Note: At this time, you cannot change DSLPipe configuration, upgrade the DSLPipe software, or upgrade the DSLPipe firmware using the on-board software. In other words, you cannot change anything by using options 1, 2, or 3 from the DSLPipe configuration window (see Figure 3-1).

Viewing configuration information

After you set up the communications software and the DSLPipe unit's configuration menu appears (see Figure 3-1), you can enter 0 to view DSLPipe status information. The DSLPipe status screen continues to refresh every few seconds -- press any key to stop the refresh. Table 3-1 describes the fields that display in the status window.

Table 3-1. Fields in the DSLPipe status window

Fields	Description
Bitpump Status	Shows either OK or NG (No Good).
Terminal Type	Indicates CO (Central Office) or RT (Remote Terminal) mode.
Operation Status	Indicates UP or DN.

Table 3-1. Fields in the DSLPipe status window (Continued)

Fields	Description
V35	Indicates OFF_line or ON_line
Data Bit Polarity	Indicates Norm (Normal) or Rev (Reverse). The default is Rev. This means that the transmitter inverts the data polarity before sending data.
Sign/Magn Bit Seq	Indicates Norm (Normal) or Rev (Reverse). The default is Rev. This means that the magnitude bit is followed by the sign bit.
Noise Margin	Shows the noise margin value (in dB). If the noise margin is less than -5dB, the SDSL line is terminated.
Data Rate	Shows the current transmission rate
DSL ch Data Encode/Decode	Shows one of the following: NRZ, NRZI, FMO, FM1, or Manchester. The default is NRZ. This means that signal transmissions go from positive to negative without ever assuming a zero value (Non-Return to Zero).
V.35 ch Data Encode/Decode	Shows one of the following: NRZ, NRZI, FMO, FM1, or Manchester. The default is NRZ. This means that signal transmissions go from positive to negative without ever assuming a zero value (Non-Return to Zero).
DSL ch Rx CRC	Shows either Enable or Disable. The default is Enable. This means that the receiver will check for CRC over the SDSL line.
DSL ch Tx CRC	Shows either Enable or Disable. The default is Enable. This means that the CRC is appended to the end of the frame when data is sent over the SDSL line.
V.35 ch Rx CRC	Shows either Enable or Disable. The default is Enable. This means that the receiver will check for CRC over the V.35 line.

Table 3-1. Fields in the DSLPipe status window (Continued)

Fields	Description
V.35 ch Tx CRC	Shows either Enable or Disable. The default is Enable. This means that the CRC is appended to the end of the frame when data is sent over the V.35 line.
V.35 ch RxC Polarity	Indicates Norm (Normal) or Rev (Reverse). The default is Norm. This means that data will be sampled at the rising edge of the clock.
V.35 ch TxC Polarity	Indicates Norm (Normal) or Rev (Reverse). The default is Norm. This means that data will be shifted out of the buffer at the falling edge of the clock.

Viewing diagnostic information

After you set up the communications software and the DSLPipe unit's configuration menu appears (see Figure 3-1), you can press 4 to enter debug mode and view diagnostic information. When you press 4, the following window appears:

SDSL V.35 DSU	Debug Mode
0. Return to Main Menu 1. Check HDLC Registers 2. Print Rx Data	

Figure 3-2. Debug Mode window

At the Select Function Items prompt, press 1 to display the HDLC registers. Table 3-2 describes the fields that display in the list that appears.

Table 3-2. Fields in the HDLC Registers list

Fields	Description
HDMARXCNTA HDMARXCNTB HINTENA HINTENB HSTATA HSTATB HCON0A HCON0B HCON1A HCON1B	These fields are not currently supported.
SDSL_RX_PACKETS V35_RX_PACKETS V35_RX_ERROR_COUNT V35_TX_ERROR_COUNT SDSL_RX_ERROR_COUNT SDSL_TX_ERROR_COUNT DMA_TXA_STATUS	Shows the number of packets received by the SDSL line. Shows the number of packets received by the V.35 line. Shows the number of errors received by the V.35 receiver. Shows the number of errors transmitted by the V.35 transmitter. Shows the number of errors received by the SDSL receiver. Shows the number of errors transmitted by the SDSL transmitter. Shows Working if the SDSL line is working. Otherwise, shows Non-Working.

Table 3-2. Fields in the HDLC Registers list (Continued)

Fields	Description
DMA_TXB_STATUS	Shows Working if the V.35 line is working. Otherwise, shows Non-Working.

Hardware Specifications

Table A-1 lists the DSLPipe DSU specifications.

Table A-1. DSLPipe DSU specifications

Physical connectors	RJ-11 for SDSL WAN DB-25 to V.35 connector
Transmission rate	144 Kbps - 2320 Kbps
DSL line code	2B1Q
Line impedance	135 ohms
Dimensions	220mm x 169mm x 40mm
Weight	Approximately 2 lbs (0.9 kg)
Electrical, power input	1A @ 9 to 18 VDC via AC Adapter
Electrical, power consumption	Less than 5 watts
Operating humidity	5% - 95%, noncondensing
Operating temperature	0-50° C
EMC	FCC-15B
Safety	UL

Warranties and FCC Regulations

B

Product warranty	B-1
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Product warranty

- 1 Lucent Technologies warrants that the DSLPipe V.35 unit will be free from defects in material and workmanship for a period of twelve (12) months from date of shipment.
- 2 Lucent Technologies shall incur no liability under this warranty if:
 - The allegedly defective goods are not returned prepaid to Lucent Technologies within thirty (30) days of the discovery of the alleged defect and in accordance with Lucent Technologies’ repair procedures; or
 - Lucent Technologies’ tests disclose that the alleged defect is not due to defects in material or workmanship.
- 3 Lucent Technologies’ liability shall be limited to either repair or replacement of the defective goods, at Lucent Technologies’ option.
- 4 Lucent Technologies **MAKES NO EXPRESS OR IMPLIED WARRANTIES REGARDING THE QUALITY, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE BEYOND THOSE THAT APPEAR IN THE APPLICABLE Lucent Technologies USER'S DOCUMENTATION. Lucent Technologies SHALL NOT BE RESPONSIBLE FOR CONSEQUENTIAL, INCIDENTAL, OR PUNITIVE DAMAGE, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR DAMAGES TO BUSINESS OR BUSINESS**

Warranties and FCC Regulations

FCC Part 15 Notice

RELATIONS. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES.

Warranty repair

- 1 During the first three (3) months of ownership, Lucent Technologies will repair or replace a defective product covered under warranty within twenty-four (24) hours of receipt of the product. During the fourth (4th) through twelfth (12th) months of ownership, Lucent Technologies will repair or replace a defective product covered under warranty within ten (10) days of receipt of the product. The warranty period for the replaced product shall be ninety (90) days or the remainder of the warranty period of the original unit, whichever is greater. Lucent Technologies will ship surface freight. Expedited freight is at customer's expense.
- 2 The customer must return the defective product to Lucent Technologies within fourteen (14) days after the request for replacement. If the defective product is not returned within this time period, Lucent Technologies will bill the customer for the product at list price.

Out-of warranty repair

Lucent Technologies will either repair or, at its option, replace a defective product not covered under warranty within ten (10) working days of its receipt. Repair charges are available from the Repair Facility upon request. The warranty on a serviced product is thirty (30) days measured from date of service. Out-of-warranty repair charges are based upon the prices in effect at the time of return.

FCC Part 15 Notice



Warning: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is unlikely to

cause harmful interference. But if it does, the user will be required to correct the interference at his or her own expense.

The authority to operate this equipment is conditioned by the requirement that no modifications will be made to the equipment unless the changes or modifications are expressly approved by Lucent Technologies.

IC CS-03 Notice

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee that the equipment will operate to the user's satisfaction.

Before installing this equipment, users should make sure that it is permissible to be connected to the facilities of the local telecommunications company. An acceptable method of connection must be used to install the equipment. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.



Warning: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

